

We claim:

1. An isolated nucleic acid encoding a polypeptide which  
5 elongates C<sub>16</sub>- or C<sub>18</sub>-fatty acids with at least two double bonds in the fatty acid by at least two carbon atoms C<sub>18:3</sub><sup>Δ5,8,11,12</sup>, C<sub>20:3</sub><sup>Δ8,11,14</sup>, C<sub>20:4</sub><sup>Δ5,8,11,14</sup> and C<sub>20:5</sub><sup>Δ5,8,11,14,17</sup> not being elongated.
- 10 2. An isolated nucleic acid comprising a nucleotide sequence encoding a polypeptide which elongates C<sub>16</sub>- or C<sub>18</sub>-fatty acids with at least two double bonds in the fatty acid molecule, selected from the group consisting of
  - 15 a) a nucleic acid sequence shown in SEQ ID NO:1,
  - b) a nucleic acid sequence which, in accordance with the degeneracy of the genetic code, is derived from the  
20 sequence shown in SEQ ID NO:2,
  - c) derivatives of the sequence shown in SEQ ID NO:1 which encode polypeptides with at least 50% homology with the sequence encoding the amino acid sequences in SEQ ID  
25 NO:2, the sequence acting as C<sub>16</sub>- or C<sub>18</sub>-elongase.
3. An isolated nucleic acid sequence according to claim 2,  
wherein the sequence is derived from an Oomycete.
4. An isolated nucleic acid sequence according to claim 2 or 3,  
30 wherein the sequence is derived from Phytophthora.
5. An amino acid sequence which is derived from an isolated nucleic acid sequence according to any of claims 2 to 4.
- 35 6. A gene construct comprising an isolated nucleic acid according to any of claims 1 to 4, wherein the nucleic acid is functionally linked to one or more regulatory signals.
7. A gene construct according to claim 6, whose gene expression  
40 is enhanced by the regulatory signals.
8. A vector comprising a nucleic acid according to claim 2 or a gene construct according to claim 6.

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9. An organism comprising at least one nucleic acid according to claim 2, a gene construct according to claim 6 or a vector according to claim 8.
- 5 10. An organism according to claim 9, wherein the organism is a microorganism, a nonhuman animal or a plant.
11. An organism according to claim 9 or 10, wherein the organism is a transgenic plant.
- 10 12. A process for the production of PUFAs, which comprises culturing an organism which comprises a nucleic acid according to claim 2, a gene construct according to claim 6 or a vector according to claim 8, encoding a polypeptide  
15 which elongates C<sub>16</sub>- or C<sub>18</sub>-fatty acids with at least two double bonds in the fatty acid molecule by at least two carbon atoms under conditions under which PUFAs are formed in the organism.
- 20 13. A process according to claim 12, wherein the PUFAs prepared by the process are C<sub>20</sub>- or C<sub>22</sub>-fatty acid molecules with at least two double bonds in the fatty acid molecule.
14. A process according to claim 13, wherein the C<sub>20</sub>- or C<sub>22</sub>-fatty  
25 acid molecules are isolated from the organism in the form of an oil, lipid or a free fatty acid.
15. A process according to any of claims 12 to 14, wherein the organism is a microorganism, a nonhuman animal or a plant.
- 30 16. A process according to any of claims 12 to 15, wherein the organism is a transgenic plant.
17. A process according to any of claims 12 to 16, wherein the  
35 C<sub>16</sub>- or C<sub>18</sub>-fatty acid is a fatty acid with three double bonds in the molecule.
18. An oil, lipid or fatty acid or a fraction thereof, prepared by the process according to any of claims 12 to 17.
- 40 19. An oil, lipid or fatty acid composition which comprises PUFAs and which is derived from a transgenic plant.
20. An oil, lipid or fatty acid composition according to claim  
45 19, wherein the PUFAs are derived from transgenic plants which comprise a nucleotide sequence according to claim 2.

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21. The use of the oil, lipid or fatty acid composition in feeding stuffs, foodstuffs, cosmetics or pharmaceuticals.

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